CLAIMS:

1. A system for decoding Reed-Muller coded information comprising:

    a first soft-output device for processing a coded signal and for producing code bit decisions and code bit reliabilities based on the coded signal; and

    a first Reed-Muller message passing device for decoding the code bit decisions and decoding the code bit reliabilities into an information bit decision and an information bit reliability vector.

2. The system of claim 1 further comprising:

    an assembler for combining the message bit reliabilities into a code word reliability vector for use in a second soft-output device, wherein each element of the code word reliability vector is a code bit reliability number.

3. The system of claim 1 further comprising:

    an assembler for combining the message bit reliabilities into a reliability vector;

    a second soft-input device for processing the coded signal based on the code word reliability vector and for producing updated code bit decisions and updated code bit reliabilities based on the coded signal and the code word reliability vector; and

    a second Reed-Muller message passing device processing the updated code bit decisions and updated code bit reliabilities into an updated information bit decision and an updated information bit reliability vector

4.   The system of claim 1, wherein the coded signal is an interleaved coded signal, the system further comprising:

> a de-interleaver positioned between the soft-output device and the Reed Muller message passing device for recovering an original sequence of coded information from a received sequence.

5.   The system of claim 1, wherein the Reed-Muller message passing decoder uses log bit reliabilities to evaluate the coded signal.

6.   A method for decoding of a Reed-Muller code comprising:

> generating a code bit vector and a log-bit probability vector based on a received coded signal using a first soft-output device;
>
> passing at least the log-bit probability vector to a second soft-output device; and
>
> generating an updated code bit vector and an updated log-bit probability vector based on the received coded signal and at least the log-bit probability vector.

7.   The method of claim 6, wherein the step of generating a code bit vector further comprises:

> decoding the received coded signal using a soft-output device to produce the code bit vector and a bit reliability vector;
>
> decoding the code bit vector and the bit reliability vector into a Reed-Muller de-coded information bit vector and an information bit reliability vector; and
>
> converting at least the information bit reliability vector into a code word reliability vector.

8.   The method of claim 7, wherein the coded signal is an interleaved signal, the method further comprising:

de-interleaving the code bit vector and the bit reliability vector.

9.   The method of claim 8,

interleaving at least the codeword reliability for use in a next soft-output device.

10.   The method of claim 6, and further comprising:

Reed-Muller decoding the updated code bit vector and an updated log-bit probability vector.

11.   The method of claim 6, wherein before the step of generating a code bit vector, the method further comprising:

inputting the coded information into the first soft-output device together with a codeword reliability vector having a value of zero such that the received coded information is processed according with zero initial reliability.

12.   A soft iterative decoding system comprising:

two or more decoding blocks for processing coded information into a decoded bit vector and a decoded probability vector, each decoding block comprising:

a soft-output device for processing the coded information according to a code word probability vector into a code bit information vector and an associated code bit reliability vector; and

a Reed-Muller device for decoding the code bit information vector and the associated code bit reliability vector; and

an assembler device between each decoding block for processing the code bit information vector and the associated code bit reliability vector from a previous decoding block into a codeword vector and an associated codeword reliability vector for a next decoding block.

13.   The system of claim 12, wherein the coded information is interleaved, the system further comprises:

a de-interleaver for re-ordering a bit sequence of the code bit information vector and the associated code bit reliability vector.

14.   The system of claim 12, wherein the coded information is interleaved, the system further comprising:

an interleaver between decoding blocks for randomly re-ordering the codeword vector and the associated codeword reliability vector.

15.   The system of claim 12 wherein each soft-output device of the two or more decoding blocks has two inputs, a first input for receiving the coded information and a second input for receiving a code word reliability vector, and wherein each soft-output device has two outputs, the code bit information vector and the associated code bit reliability vector.

16.   The system of claim 15 wherein the second input of the soft-output device of a first decoding block of the two or more decoding blocks is a zero vector.

17.   A method of decoding Reed-Muller codes by passing message bits, the method comprising:

computing message bit likelihoods for each bit in a bit sequence
of a Reed-Muller coded signal;

updating the code bit likelihoods according to the message bit
likelihoods; and

re-computing the message bit likelihoods according to the
updated code bit likelihoods.

18.   The method of claim 17 wherein the method is repeated to improve
decoding accuracy.

19.   The method of claim 17 wherein the method of computing comprises:

processing the Reed-Muller coded signal to generate an
information bit vector and a information bit probability;
and

outputting both the information bit vector and the information bit
probability for further processing.

20.   The method of claim 19, wherein the code bit reliability vector is a log-
bit-likelihood.

21.   A iterative decoding system for decoding a received signal containing
Reed-Muller encoded information, the system comprising:

a sequence of decoding blocks for processing the received signal
into a decoded signal, each decoding block comprising:

a soft input device for processing the encoded information from
the encoded signal into code bits and associated code bit
likelihoods; and

a reed-muller message passing device for processing the code bits
and the associated code bit likelihoods into message bits
and message bit likelihoods;

connections between an output of the reed-muller message passing device and an input for a next soft input device in the sequence, wherein a sequentially last decoding block in the sequence produces an output.

22.   The iterative decoding system of claim 21 wherein the message bit likelihoods are log likelihood ratios for the message bit.

23.   The iterative decoding system of claim 21 further comprising:

an interleaver disposed both between each soft input device and each reed-muller message passing device and between each decoding block in the sequence of decoding blocks.

24.   The iterative decoding system of claim 21 wherein the system is implemented in a circuit.

25.   The iterative decoding system of claim 21 wherein the connections are logical connections.